

A longitudinal analysis of UK second-generation disadvantaged immigrants

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ABSTRACT We consider the relative academic achievement in primary school of second-generation immigrant children in the UK. The education progress of these groups of children is of historical interest and is also relevant to the policy debate today since ethnic minority students in England continue to have lower levels of achievement in primary school, though they go on to catch up with their White counterparts in secondary school. We use rich data for a cohort born in 1970 and find that children born to South Asian or Afro-Caribbean parents have significantly lower levels of cognitive achievement in both mathematics and language in primary school. Our analysis also reveals that the negative impact from being born to South Asian parents decreases during primary school while the negative effect from being born to Afro-Caribbean parents remains approximately stable. Hence our evidence shows that even as long ago as the late 1970s, whilst most ethnic minority groups had lower academic achievement in primary school, some groups of ethnic minority pupils, namely those from South Asia, were showing signs of ‘catch up’.

KEY WORDS: Second-generation immigrants; educational disadvantage.

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1. Introduction

It is well known that in the UK, immigration status matters for economic outcomes later on in life (Dustmann and Fabbri, 2003). However, there is relatively limited empirical evidence on how the disadvantage (or advantage) of being an *immigrant* impacts on a child's progression through the UK education system. In this paper we take an historical and longitudinal perspective, assessing the impact of being a second-generation immigrant child in the 1970s on the child's cognitive skill development between the ages of 5 and 10 i.e. in primary school. Specifically, we ask whether certain ethnic minority groups had higher or lower levels of achievement at that time and whether they made more or less progress in primary school than Whites, once we allow for a range of other factors that influence educational progress. We use an incredibly rich data set and hence can model the distinct contribution of being a second generation immigrant on educational achievement and progress, as distinct from other important factors such as parental education and socio-economic status and indeed parental aspirations. The aim of the analysis is to provide an historical description of the gaps in education achievement that emerged between second-generation immigrant children and natives in primary school in the 1970s. Clearly in the intervening period there have been changes to the UK education system, including the introduction of policies aimed specifically at improving the educational performance of ethnic minority students. It is of interest therefore to compare the situation of these ethnic minority groups in the earlier period against the current situation.

Specifically in this study, we use data on individuals born in 1970, comparing the early cognitive skills of children born to immigrants as compared to non immigrant children. We are able to consider the cognitive skill development of four ethnic groups: children with both parents born in a) UK or Europe; b) South Asia; c) Caribbean and d) other countries and mixed combinations. Data unfortunately precludes a more disaggregated categorisation of the ethnic origin of migrants. We seek to measure the impact of parental migrant status on cognitive skills at age 5 on entry into primary school, and at age 10 as children leave primary school, and progression between these ages. As has been said, the advantage of the data set we use is that it contains rich panel data on a range of individual and family characteristics and therefore in the analysis we are able to control for a large number of factors that influence

cognitive skill development, including individual characteristics, family environment and family resources. The limitation of our data set however, is that it can only reliably measure the relative educational performance of second generation immigrant children in primary school, rather than secondary school or indeed beyond. This is because of attrition and missing test score information for many ethnic minority students at age 16. However, given the recent body of evidence from economics, child psychology and neuroscience on the importance of early cognitive development, we feel this is not a crucial limitation (Cunha and Heckman, 2008 and 2009). This evidence clearly suggests that the pre-school and primary phases are critical in children's development and that early cognitive achievement is highly predictive of later achievement. We also argue that the richness of our data set outweighs its limitations in this context. Alternative data sources either lack the longitudinal element and family background controls (e.g. the Labour Force Survey) or are too early to contain sufficient number of ethnic minority students (e.g. the National Child Development Study) or too recent to include appropriate outcome measures (e.g. the Millennium Cohort Study). Hence we view our choice of data set as appropriate, though we would urge that this work be repeated using the Millennium Cohort Study, when primary school outcome measures, such as Key Stage 2 test scores, are available in these data.

The evidence presented in this paper relates to three recent papers that have examined these issues in the context of English *secondary* schools. Firstly, Wilson et al. (2009) modeled the progression of ethnic minority students (as distinct from immigrants per se) through secondary school and found that ethnic minority students make more progress than their white counterparts in today's secondary schools, though many ethnic minority groups enter secondary school with lower levels of achievement than Whites. A paper by Dustmann and Theodoropoulos (2008) investigated the magnitude of the gaps in education achievement between ethnic minority students and their white counterparts, confirming that most ethnic minority groups have higher levels of education achievement than whites in secondary school. This paper also explored reasons why this educational advantage does not translate into economic advantage in the labour market. Additionally, Algan et al. (2010) compared the education and labour market performance of first and second-generation immigrants in three European countries (France, Germany and the UK). They showed that second-generation immigrants left school at a later age in the UK compared to the native population. But they showed the educational progress made between first and second generations varies according to national origin, in particular Bangladeshi and Pakistani second-generation immigrants

manage to close the gap that existed for their parents, while Caribbean children only marginally increase their school leaving age relative to whites.

Of course these recent papers refer to the *current* UK education system rather than the earlier period which we consider in this paper and the policy framework has changed over time. Certainly a number of policy interventions have been targeted at ethnic minority students specifically over this period. Indeed in the UK, policy-makers have been concerned about the education achievement of children from ethnic minority groups since the end of 1970s. In March 1979 the UK government set up the Committee of Enquiry into the education of children from ethnic minority groups, with a particular focus on the children of Caribbean origin. The Committee published an interim report in 1981 and the final report in 1985 (*Education for all*). This report, also called the Swann Report, identified under achievement amongst some ethnic minority groups and called for greater policy attention to address this problem.

Since that report there have been numerous government policies aimed at improving the education achievement of ethnic minority students. More recent policies include those targeted at low SES urban populations, which include a disproportionate number of ethnic minority students. An example of this kind of policy was the Excellence in Cities project introduced in 1999 by the previous Labour government to improve achievement in inner city schools, and which generally have a higher proportion of ethnic minority and recent migrant children than other schools. This policy was found to have impacted on medium to high ability children in the most disadvantaged schools but was not explicitly aimed at improving the achievement of ethnic minority students (Machin et al. 2004). As part of this Excellence in Cities initiative a specific policy was subsequently developed targeted at ethnic minority students, namely the Ethnic Minority Achievement Grant. This was a grant, introduced in 2002, and designed to provide additional support to ethnic minority students and particularly recent arrivals to the UK (Cunningham et al., 2004). Although this paper does not assess the effectiveness of such policies, it does give an historical account of the situation in primary schools for ethnic minority students prior to the introduction of many of these interventions, against which more recent trends can be compared.

The evidence in this paper is also relevant to the wider international literature on the educational attainment of immigrants. For example: Colding (2006) estimates a dynamic model of educational progression to determine at what stages of their educational careers

children of immigrants fall behind their native peers and the magnitude of any intergenerational transmission of educational disadvantage. Their results corroborate previous findings that family background is an important determinant of educational outcomes but also suggest that differences in endowments alone do not explain the observed gap in educational attainment between natives and ethnic minorities. The empirical analyses use two large data sets from Denmark (for the period 1984–2001). Gang & Zimmermann (2000), on Germany, conclude that parental schooling plays no role in the educational attainment of foreign born children in Germany, whereas it plays a major role in the educational attainment of the native born children. Riphahn (2003) focuses on the educational attainment of German born second generation immigrants, and finds that their schooling success still lags behind that of natives. In the case of the Netherlands, Van Ours & Veenman, (2006), based on panel data, show that there are no differences between the educational attainment of second-generation immigrants and natives, once age and parental education are controlled for. This latter study suggests that the difference between the educational level of the parents of the second generation immigrants and the parents of the natives, explains the educational gap between immigrants and natives. This paper seeks to add to this literature by examining the educational gap between natives and second generation immigrant children in a UK historical context.

The paper is organized into six parts. Section 2 provides a theoretical framework and model. Section 3 describes the data used in our analysis, provides descriptive statistics of the samples used and presents information on the key outcome measures, namely test scores at ages 5 and 10. Section 4 presents our results, firstly estimates of the impact of ethnic group origin on ability tests at age 5 and 10 and secondly on progression between ages 5 and 10. Section 5 concludes with a summary of findings and their policy implications.

2. Theoretical framework and model

Children's scores on cognitive scores are influenced by many factors, and are good predictors of future labour market outcomes (e.g. Neal and Johnson, 1996, Cameron and Heckman, 1999 and Cunha and Heckman, 2008, for the USA, and Currie and Thomas, 1999, Dolton et al, 2005, for the UK). Hence the educational achievement of ethnic minority students is of paramount concern as it is predictive of future labour market success.

In this paper we draw on human capital theory and the education production function literature for our theoretical framework. This framework suggests that resource inputs are invested in the child to produce human capital, as measured by test scores or educational achievement. There are numerous different types of inputs to consider, including parental inputs (resources, parental interest in the child, parental education), schooling (the quality of teachers and schools) and peer inputs. Thus some children are likely to have lower test scores and poorer cognitive development because they have had fewer resource inputs. Children from low socio-economic status backgrounds for example are likely to have lower cognitive achievement as their parents are less able to invest in their children to the same extent (since they have lower income, less education and may have less time - see Todd and Wolpin, 2003, for an overview).

This production function literature suggests a number of reasons why ethnic minority groups might have lower levels of educational achievement. Firstly, ethnicity is correlated with a range of resources that are known to have strong positive impacts on children's academic achievement, such as socio-economic status and parental education (see, e.g., Coleman, 1966; Leibowitz, 1974; Haveman and Wolfe, 1995). Ethnicity may also be correlated with school quality (Fryer and Lewitt, 2004 and Dustmann et al., 2010), again implying that the apparent impact from ethnicity on achievement may in fact be spurious and due to omitted variable bias. There is a literature which suggests that ethnicity may in and of itself have a negative impact on education achievement in some contexts, perhaps due to discrimination against certain ethnic groups by education professionals (Baron et al., 1985 and Tomlinson, 2001). Ethnic minority parents and their children may also have lower (or higher) education aspirations if the value of education in the labour market is seen to be less (or greater) for such groups. Another explanation is that ethnic minority students may have a disincentive to invest in human capital since they earn less in the labour market for a given level of education achievement (Dustmann and Theodoropoulos, 2008).

In this paper we assess the relative cognitive achievement levels of ethnic minority children born in the UK in 1970 in primary school, using the Educational Production Function framework (EPF) set out by Todd and Wolpin (2003). In its general form, the model is as specified in equations (1) and (2):

$$y_{i,5} = \alpha_0 + X'_{i,5}\beta_0 + \delta_0 z_{i,5} + u_{i,5} \quad (1)$$

$$y_{i,10} = \alpha_1 + X'_{i,10}\beta_1 + \delta_1 z_{i,10} + \gamma_{i,5} + u_{i,10} \quad (2)$$

where $y_{i,5}$ and $y_{i,10}$ are respectively the scores of individual i at age 5 and 10, $X_{i,5}$ and $X_{i,10}$ are the family and other socio-economic characteristics (assumed to be non-stochastic) which influence test scores at age 5 and at age 10 respectively. The variables $z_{i,5}$ and $z_{i,10}$ represent the ability of individual i at age 5 and at age 10 respectively. The stochastic error terms in the two equations are $u_{i,5}$ and $u_{i,10}$.

If we wish to model the determinants of age 10 test scores in this framework, the simple Production Function estimator can be described by making the following assumptions about the structural form model in equations (1) and (2):

$$\begin{aligned} E(u_{i,10} / X_{i,10}) &= 0 ; \\ \delta_0 z_{i,5} &= \delta_1 z_{i,10} = 0 ; \\ \gamma &= 0 \end{aligned}$$

This implies the following reduced form:

$$y_{i,10} = \alpha_1 + X'_{i,10}\beta_1 + u_{i,10} \quad (3)$$

This specification assumes that pre-age ten cognitive scores play no role in the performance at age 10 and that any inherent ability either does not influence test scores at age 10. Both these assumptions are highly problematic.

Hence an alternative and preferred specification is the Value Added Estimator, which measures educational progress. The value added specification assumes that a previous test score is a sufficient statistic for the inputs into the child's cognitive development prior to a particular point in time and indeed their inherent ability. As set out by Todd and Wolpin (2003) the value added estimator has the following structure:

$$\begin{aligned} E(u_{i,10} / X_{i,10}) &= 0 ; \\ E(u_{i,10} / y_{i,10}) &= 0 ; \\ \delta_0 z_{i,5} &= \delta_1 z_{i,10} = 0 ; \\ \gamma &\neq 0, \gamma \neq 1 \end{aligned}$$

The estimating model we adopt for our analysis is therefore:

$$y_{i,10} = \alpha_1 + X'_{i,10}\beta_1 + \mathcal{N}_{i,5} + u_{i,10} \quad (4)$$

This model measures the relationship between pupil characteristics and resource inputs and test scores at age 10, conditional on test scores at age 5. Hence in the context of this paper when we apply this value added model, we are measuring the additional effect of being a second generation immigrant child on educational achievement (in primary school), over and above any early effect from immigrant status on cognitive skill on entry into primary school. We recognize that the literature has suggested that cognitive skills are formed in the early years and hence we also estimate models of cognitive skill at age 5 to determine the association between migrant status and cognitive skill on entry into school.

The models described above require us to control for a range of factors that influence children's cognitive development and particularly those correlated with ethnic origin. Those factors that have been found to be important in the literature include various pupil characteristics (gender, birth-weight for example), as well as measures of socio-economic status (specifically parental education and parental social class). Variables measuring the resources available to the child have also been found to be important. These include family income, the number of siblings, the language used in the home and the parents' attitudes to education and interest in the child's education. In our data the average number of siblings for UK born pupils is just over 2 and around 3.5 for South Asian children and just under 3 for Afro-Caribbean children, hence we anticipate that this variable may be particularly important when considering the relative achievement of these minority groups. Some of the literature has also shown that birth order is an important determinant of academic achievement (Hauser and Sewell, 1985; Behrman et al. 1986; Hanushek, 1992 and Black et al. 2005) and we include this as an additional measure of the resources available to the child in the home.

Language is likely to be particularly important in the context of our analysis of the cognitive achievement of ethnic minority students. Poor national performances in international tests are sometimes explained by the fact that there are a lot of immigrants in the country and that these immigrants are not fluent in the language of the host country (OECD, 2006). Specifically Schnepf (2007) found that "in the UK and the USA, language skills seem to be the greatest barrier for immigrants to reach similar achievement scores than natives". This result is also found by Dustmann et al. (2010) who followed a cohort during their compulsory education

over the period 1997-2008. Hence inclusion of a measure of language spoken in the home is critically important.

In addition we need to control for parenting behaviours, such as whether the mother reads to the child, in an attempt to allow for what is usually unobserved characteristics of the mother that may influence the child's cognitive development.

Differences in the quality of schooling pupils experience will also impact on their cognitive achievement (research suggests that around 10-20 of the variation between pupils appears attributable to the school they attend (Reynolds et al., 1996)). School quality however, is extremely difficult to define (Gray, 2004) and measure. Resources allocated to schools, such as class sizes and expenditure per pupil, are not necessarily highly correlated with school quality (Hanushek, 1997). More crucially from a modelling perspective, it is clearly the case that school choice is endogenous. Parents move to particular areas to access particular schools (see Gibbons and Machin (2003) who also show that parents pay a considerable premium to access good quality secondary schools). A simple OLS regression which controls for school characteristics is implicitly assuming that pupils are randomly allocated to schools and hence would yield biased coefficients on the school quality variables. Additionally in our data we only have one or two children per school so identifying any school effect is impossible. We are therefore not able to control for the quality of primary school attended. To the extent that children from South Asian and Afro-Caribbean parentage attend inferior quality schools, we may be over stating the effect of migrant status. However, since access to poor quality schooling is one mechanism by which migrant status is likely to impact on cognitive achievement, we do not believe this undermines the usefulness of our results.

We do however, present a specification which controls for the local authority in which the child is being educated, recognising that local authorities have unobserved characteristics that may influence school quality and the educational achievement of children. In particular, one might be concerned about funding differences across local authorities and differences in key education policies (e.g. their attitude to ability selection across and within schools or indeed their approach to integration of ethnic minority children and the children of recent migrants). Ethnic minority children today tend to be clustered in just a few local authorities in urban areas (and this was more so in the 1970s) and hence controlling for any effect from local authority on test scores is important though it does not completely account for differences in

school quality. When controlling for local authority effects, we opt for a fixed effect approach since we are concerned that a random effects model in this context may be violated if unobserved characteristics of local authorities are correlated with our variable of interest.

3. Data and descriptive statistics

The data we use to estimate this model is the British Cohort Study (BCS) 1970, which, as we have already argued, is a good data source with which to analyse the education achievement of second-generation immigrants. The BCS sample is based on all children who were born in UK during one week in April 1970¹ and the data collected on these children throughout their life course is incredibly rich. Following Brewer and Haslum (1986), we define the ethnic groups to which children belong according to the parental region of birth. As presented in table 1, we focus on three ethnic groups: both parents are born in UK or Europe; both parents are born in South Asia; and both parents are born in the Afro-Caribbean region.² Other ethnic groups (e.g. children of parents born in other countries - 100 observations) and other combinations (e.g. children from mixed parents - 752 in total) are grouped together in a fourth Other/Mixed category.

Table 1. Ethnic groups of second-generation immigrants (BCS 1970)

Parental region of birth	BCS 1970	
	N	%
UK/Europe	15670	91.23
South Asia	366	2.13
Afro Caribbean	288	1.68
Other/Mixed	852	4.96
Total	17176	

Data Sources: 1970 BCS Age 0 survey. Missing data n=1897.

In terms of modern classifications of ethnicity, the BCS70 data is obviously quite crude. We are unable to disaggregate these ethnic origin groups as finely as we would like. Thus there is some heterogeneity within the different ethnic groups.

As has been said, ideally we would like to explore these children's cognitive skill development throughout their compulsory schooling. Although the BCS children sat the tests at in primary school (ages 5 and 10) *and* secondary school (age 16), there are difficulties in

using test score information and educational achievement data at age 16 for an analysis of this kind. Firstly, there are problems with sample sizes for minority ethnic group children. Only 6009 children in the BCS data were tested at age 16 and of this 6009, only 4505 were also tested at age 10. There are only 33 Caribbean children and 70 South Asian children in this 4505 sample. The second reason for not using the age 16 data is that a strike took place during the sixteen-year follow-up. This meant some children in the BCS70 data were not able to sit the tests for example. We might hypothesise that strike action did not take place randomly and some types of schools would have been more prone to strike action than others. This would lead to sample selection problems with the age 16 test scores, and this indeed may explain why we have only 33 Afro Caribbean origin children in the sample. For these reasons, we focus on cognitive development in primary school only. As we have argued earlier, this is not a major limitation given the evidence on the importance of early cognitive achievement for future educational and labour market achievement (Cunha and Heckman, 2008 and 2009).

3.1 Test score data

For BCS70, tests and assessments of the child's ability were administered in their homes by health visitors. The tests administered at age 5 included the *Human Figure Drawing Test*, a *Copying Designs Test* and the *English Picture Vocabulary Test (EPVT)*. The scoring of the *Human Figure Drawing* and *Copying Designs* tests was relatively subjective e.g. coders had to determine whether the drawing conformed to certain standards specified in the instructions. By contrast, the other tests were more objective. In particular the mean vocabulary *EPV* scores showed no differences across coders. We therefore rely on the *EPV Test* as a potentially more objective measure of the child's cognitive skill at age 5. We also use cognitive skill tests administered at age 10, namely the *Edinburgh Reading Test* and the *Friendly Mathematics Test*. A brief description of all these tests is presented in Appendix A.

The tests taken at age 5 and 10 are scored on different scales at each age. This is problematic as we want to compare different tests at different ages. We therefore standardise each test score so that the z-scores are comparable across tests. What is potentially more problematic is that the *English Picture Vocabulary Test* at age 5 was designed to measure a somewhat different aspect of a child's cognitive development than the mathematics and reading tests used at age 10, though all three tests measure cognitive skills. Hence comparability across the early and later tests may be an issue. We acknowledge that this is a potential problem but the correlations between the *EPVT* and *ERT* and the *EPVT* and *FMT* are significant at the 1%

level (0.44 and 0.39, respectively). Further, unless we believe that the underlying relationship between the two sets of tests differs systematically by ethnic origin, we may be less concerned than we would be otherwise that the earlier tests are measuring slightly different aspects of a child's cognitive achievement. This is because in our analysis we are focusing on the relative position of ethnic minority children in the test score distribution at the two points in time rather than their absolute skill levels.

We work with different samples for different parts of the analysis, depending on which outcome is being analysed. Table 2 presents the proportion of the sample in each ethnic group for each of the tests we use (EPVT, ERT and FMT) and for the restricted sample of pupils who took the tests at both age 5 and 10. Sample sizes vary according to the test being considered. The restricted sample includes 8613 children who have been tested both in EPVT at age 5 and in ERT and FMT at age 10. Table A2 in Appendix A shows the mean and standard deviations for each variable used in our modelling, comparing results for the full sample at age 10 with this restricted sample in order to provide some evidence of the stability in the composition of the restricted sample. This table suggests that as the means across most variables are very similar and we do not believe we have major attrition bias.

Table 2. Sample sizes

Parental region of birth	Full sample (age 5 - EPVT)		Full sample (age 10 - ERT)		Full sample (age 10 - FMT)		Restricted sample (ages 5 and 10)	
	N	%	N	%	N	%	N	%
UK/Europe	10144	94.51	9954	93.18	9964	93.16	8140	94.51
South Asia	92	0.86	167	1.56	168	1.57	63	0.73
Afro Caribbean	126	1.17	141	1.32	142	1.33	94	1.09
Other/Mixed	371	3.46	421	3.94	422	3.95	316	3.67
Total	10733		10683		10696		8613	

Data Sources: 1970 BCS Age 0 survey, 1975 BCS Age 5 survey and 1980 BCS Age 10 survey.

In Figures 1 to 3 we show the unconditional distribution of the three standardised tests score, namely EPVT at age 5 and ERT and FMT at age 10, by ethnic group. It may be inferred from these figures that on entry into primary school at age 5, and on completion of primary school at age 10, regardless of the test we consider, children born from Other/Mixed and UK/European parents show quite similar score distributions to one another and higher achievement than children from other ethnic origins.

Figure 1. Standardized EPVT at age 5 by ethnic groups

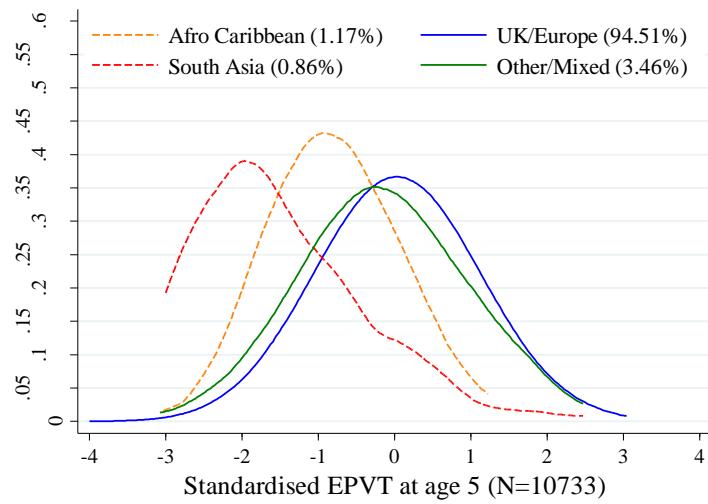


Figure 2. Standardized ERT at age 10 by ethnic groups

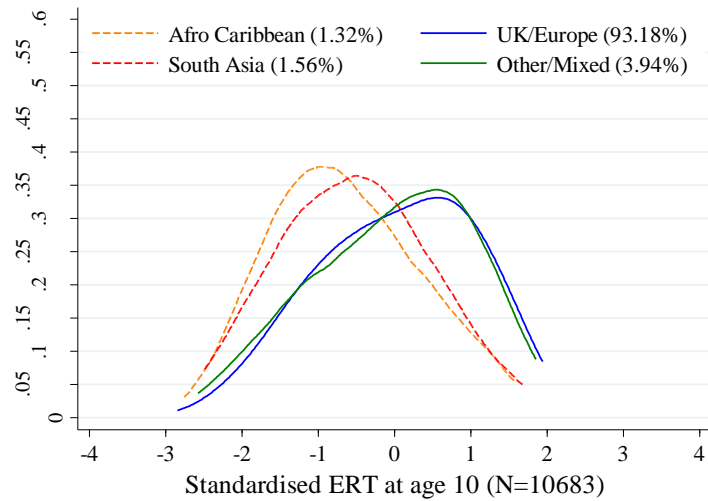


Figure 3. Standardized FMT at age 10 by ethnic groups

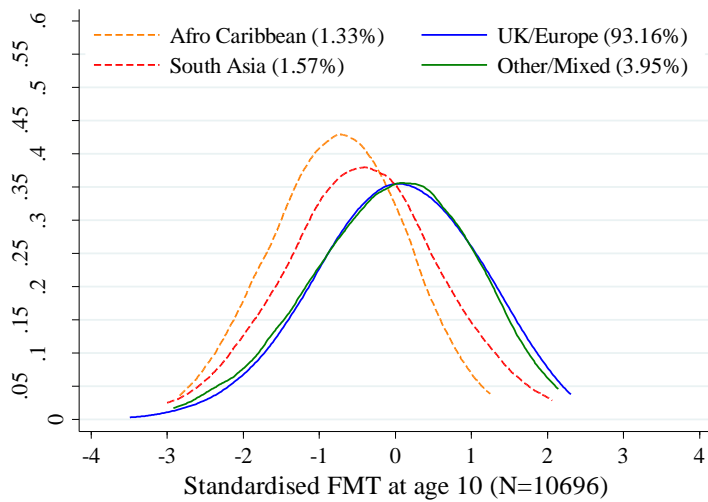
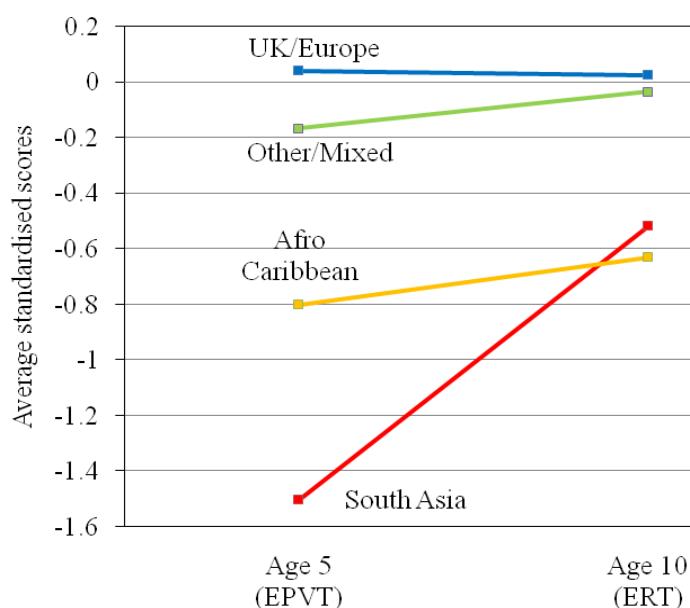
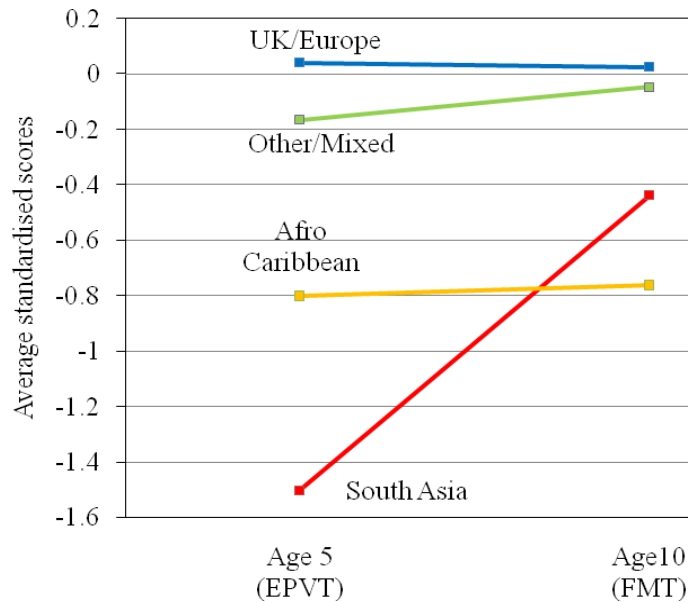


Figure 4 presents average standardised test scores at age 5 and 10 by ethnic groups so that we can consider progression between these two ages. The first figure shows the results using the Edinburgh Reading Test at age 10, whilst the second figure uses the Friendly Mathematics Test at age 10. At age 5, we can see that children in the Afro Caribbean and South Asia categories perform worse than those with UK/European born parents. The most disadvantaged children are those with both parents born in South Asia who perform about 2 standard deviations below children with both parents born in UK/Europe. This suggests that these minority groups start school at a disadvantage in terms of their cognitive skill. Interestingly, this difference among ethnic groups tends to decrease considerably between age 5 and 10 suggesting some narrowing of the migrant gap in cognitive skill as children progress through primary schooling. The catch up appears particularly steep for South Asian pupils. This pattern is consistent across tests.

Figure 4. Average standardized scores at age 5 and 10 by ethnic groups





Data Sources: 1970 BCS Age 0 survey, 1975 BCS Age 5 survey and 1980 BCS Age 10 survey. Notes: sample sizes are 10733 children at age 5 for *English Picture Vocabulary Test* (EPVT), 10683 at age 10 for *Edinburgh Reading Test* (ERT) and 10696 at age 10 for *Friendly Maths Test* (FMT).

Across all ethnic groups, including those of UK/European origin, there is movement up and down the test score distribution between ages 5 and 10 as presented in Tables 3 and 4, which show the quintile distribution of children's test scores between age 5 and 10. If each child stays in his/her quintile of origin, everybody should be on the diagonal. As we can see, this is not the case. The pattern of movement in the quintile distribution from age 5 to 10 is very similar regardless of whether we focus on the ERT or the FMT test.

Table 3. EPVT age 5 and ERT age 10 quintile distributions (row percentages)

EPVT at age 5	ERT at age 10					Total
	First	Second	Third	Fourth	Fifth	
First	752 (42.82)	458 (26.08)	265 (15.09)	182 (10.36)	99 (5.64)	1756 (20.39)
Second	513 (27.76)	472 (25.54)	391 (21.16)	291 (15.75)	181 (9.79)	1848 (21.46)
Third	283 (15.13)	405 (21.65)	424 (22.66)	428 (22.88)	331 (17.69)	1871 (21.72)
Fourth	175 (11.21)	249 (15.95)	344 (22.04)	373 (23.89)	420 (26.91)	1561 (18.12)
Fifth	110 (6.98)	175 (11.10)	275 (17.44)	359 (22.76)	658 (41.72)	1577 (18.31)
Total	1833 (21.28)	1759 (20.42)	1699 (19.73)	1633 (18.96)	1689 (19.61)	8613 (100)

Data Sources: 1970 BCS Age 0 survey, 1975 BCS Age 5 survey and 1980 BCS Age 10 survey.

Table 4. EPVT age 5 and FMT age 10 quintile distributions (row percentages)

EPVT at age 5	FMT at age 10					Total
	First	Second	Third	Fourth	Fifth	
First	742 (42.26)	389 (22.15)	304 (17.31)	197 (11.22)	124 (7.06)	1756 (20.39)
Second	475 (25.70)	443 (23.97)	395 (21.37)	316 (17.10)	219 (11.85)	1848 (21.46)
Third	288 (15.39)	410 (21.91)	491 (26.24)	376 (20.10)	306 (16.35)	1871 (21.72)
Fourth	189 (12.11)	244 (15.63)	368 (23.57)	353 (22.61)	407 (26.07)	1561 (18.12)
Fifth	115 (7.29)	198 (12.56)	306 (19.40)	396 (25.11)	562 (35.64)	1577 (18.31)
Total	1809 (21.00)	1684 (19.55)	1864 (21.64)	1638 (19.02)	1618 (18.79)	8613 (100)

Data Sources: 1970 BCS Age 0 survey, 1975 BCS Age 5 survey and 1980 BCS Age 10 survey.

3.2 Key explanatory variables

In section 2 we outlined a number of key control variables that need to be included in our models, based on the theoretical Education Production Function literature, as surveyed in Todd and Wolpin (2003), and the existing empirical evidence on factors that are known to determine children's cognitive skill. The exact choice of variable used to proxy these factors that have been identified from the literature is partially driven by what is available in the data.

In our data we have the following measures: gender, birth-weight, age, parental education, socio-economic status of the parents, family income, the number of siblings, the parents' attitudes to education and interest in the child's education, birth order, a dummy variable indicating whether English is spoken in the home and the number of days the mother reads to the child per week. Descriptive statistics for all the variables used in the analysis are in Appendix A.

4. Results

4.1 The impact of ethnic group on test scores at ages 5 and 10

We are interested in determining the relationship between ethnicity and test score progression in primary school controlling for other factors, recognising that the raw differential in test scores between ethnic groups is likely to be spurious, in the sense that it reflects differences in resource endowments across these different groups of children. The unconditional association

between parental ethnic origin and test scores at age 5 (EPVT) and 10 (ERT and FMT), i.e. from a model with no additional controls, confirms that children with both parents identified as South Asian or Afro Caribbean performed worse than children with both parents born in UK/Europe at both age 5 and 10 (results not shown). Specifically at age 5, the most disadvantaged children are those with both parents born in South Asia (who achieve test scores 1.54 standard deviations below children whose parents were born in the UK or Europe). Children with parents of Afro/Caribbean origin also had lower test scores than those whose parents were born in the UK or Europe (i.e. 0.84 standard deviations lower). At age 10, those with the lowest test scores on average are those of Afro-Caribbean origin (between 0.31 and 0.44 standard deviations lower), followed by those with both parents born in South Asia (0.015 standard deviations lower –significant only in the case of FMT). Children whose parents are identified as being in the “Other/Mixed” category also do significantly worse than natives at age 10. The raw association between being born to South Asian parents decreases between age 5 and age 10 whilst the negative association with test scores from being born to Afro-Caribbean parents remains stable. These raw correlations hint therefore that as children progress through primary school the gap reduces for South Asian pupils but not for those of Afro-Caribbean origin.

These raw differences between ethnic groups are however, likely to be spurious if other individual characteristics and family background factors vary by ethnicity and have their own independent effect on test scores. In Table 5 we therefore present regression results which control for the full range of individual and family characteristics that were discussed earlier.

The results from Table 5 suggest that being a second-generation immigrant of South Asian origin is negatively associated with test scores at on entry into school at age 5: South Asian origin children achieve 0.8 SD lower test scores than those with UK/European born parents. This difference is much lower than the unconditional difference cited earlier (1.5 SD) and implies that South Asian origin children achieve 29% lower test scores than UK/European origin children (see Table A4 Appendix A for these percentage differences). Further, being of South Asian is no longer significantly associated with test scores at age 10, once we fully control for other family background characteristics (but excluding age 5 test scores – see next section on progression). This suggests that at age 10 at least, some of the apparent negative effect of being born to a South Asian immigrant family in the raw correlations is really attributable to other factors, such as family financial circumstances, parental education and attitudes. Although the standard errors are relatively large for these models and we should be

cautious about this result, it also suggests that South Asian second generation immigrants appear to catch up with children whose parents were born in the UK during primary school.

The same is not true for children born to Afro-Caribbean parents. These children have lower cognitive skills in mathematics and language at both age 5 on entry into primary school and at age 10.³ At age 5 they score 0.44SD (16%) lower test scores than those of UK/European origin, again much lower than the unconditional difference of 0.8SD. By age 10 using the model which controls for the fully range of family background factors, the difference between children of Afro-Caribbean origin and UK/European origin is reduced further to 0.2-0.3 SD (7-8%) depending on the exact test used at age 10. Additionally, we observe that controlling for the local authority attended by the child reduces the extent of the test score gap between children of UK born parents and those of Afro-Caribbean born parents. This suggests that some of this gap in test scores is attributable to differences across local authorities. We must be mindful however, that to the extent that there is systematic sorting of children across local authorities, such that ethnic minority children tend to live in certain types of local authorities (deprived ones in urban areas), then our estimates with local authority controls understate the educational disadvantage experienced by ethnic minority children.

Table 5. The impact of parents' country of birth on children's test scores at ages 5 and 10

	Age 5		Age 10		Age 10	
	EPVT (1)	EPVT (2)	ERT (3)	ERT (4)	FMT (5)	FMT (6)
UK/Europe	ref.	ref.	ref.	ref.	ref.	ref.
South Asia	-0.829*** (0.110)	-0.797*** (0.113)	-0.071 (0.080)	-0.047 (0.083)	-0.151* (0.081)	-0.089 (0.083)
Afro Caribbean	-0.491*** (0.081)	-0.437*** (0.084)	-0.312*** (0.075)	-0.213*** (0.078)	-0.444*** (0.075)	-0.306*** (0.078)
Other/Mixed	-0.100** (0.048)	-0.098** (0.048)	-0.014 (0.044)	0.001 (0.044)	-0.007 (0.044)	0.016 (0.044)
Individual characteristics	✓	✓	✓	✓	✓	✓
Family Background	✓	✓	✓	✓	✓	✓
LEAs fixed effects		✓		✓		✓
Constant	-2.871*** (0.425)	-1.932*** (0.492)	-2.879*** (0.400)	-2.621*** (0.469)	-3.665*** (0.405)	-3.430*** (0.471)
Observations	10733	10733	10683	10683	10696	10696
Adjusted R ²	0.205	0.210	0.247	0.252	0.222	0.234

Data Sources: 1970 BCS Age 0 survey, 1975 BCS Age 5 survey and 1980 BCS Age 10 survey. Notes: dependant variables are standardised test scores at age 5 and 10. Standard errors are in parentheses. ***: significant at 1%, **: significant at 5%, *: significant at 10%. LEAs: Local Education Authorities. Summary statistics are reported in table A2 in Appendix A.

The coefficients on other variables in the model are presented in table A3 in Appendix A. We note that the addition of a number of key control variables substantially reduce the magnitude of the negative association between ethnic group and test scores. In particular, we found that parental interest in the child's education is positively and significantly related to academic achievement at age 5 and 10. We also found that the extent to which mothers read to their children at age 5 has a positive significant effect on test scores. Inclusion of these family environment measures reduced the negative association between migrant status and test scores at age 5 and 10. This implies that the educational disadvantage experienced by these ethnic minority children is partially related to parental inputs into the child's education, perhaps reflecting how easy migrant parents find it is to engage with their child's schooling. We also found that the number of siblings is negatively significant in the age 5 model, as expected. The negative effect from being born to South Asian or Afro-Caribbean parents is reduced once we control for family size. Controlling for the fact that the child was first born does not however change our results, although the first born variable is negative and significant at age

5, positive and significant at age 10 in reading and not significant in the mathematics equation at age 10.

We also found that if a child does not speak English in the home at age 5, this has a significant and negative effect on their EPVT score at age 5 but not on their ERT score at age 10. This result held even controlling for parental education. To investigate the importance of language in the home further, we also explored interactions between language spoken and migrant status. We found no interaction between being of Afro-Caribbean origin and language and a counter-intuitively signed interaction between being of South Asian origin and not speaking English at home on just one test score (ERT scores at age 10). Only 6% of children of South Asian parentage actually claim to speak English in their homes so this sample size means we should be cautious in reading too much into this result.

4.2 The impact of ethnic group on tests score progression in primary school

Thus far we have modelled the relationship between migrant status and test scores at the beginning and end of primary school. We are also interested in determining the relationship between migrant status and progress in primary school, controlling for each child's cognitive skill on entry into primary and other factors influencing their cognitive development (equation 4).

Two models are presented below in Table 6, one which allows a flexible relationship between prior age 5 achievement and age 10 achievement and an alternative value added model where we regress the change in test score percentile achieved between age 10 and age 5 allowing for the child's starting point in the test score distribution at age 5 and the full range of background variables. The estimates presented in this section are based on a restricted sample for whom we have full test score information at both ages 5 and 10.

The first two columns (1a/b) in table 6 show equivalent results to those presented in columns 3 and 4 of table 5, i.e. focusing on the Edinburgh Reading Test as the outcome measure at age 10. However, the results differ somewhat from table 5 since the model is estimated on a different (more restricted sample). Qualitatively however, the results are similar in that they confirm that when one controls for family background and parental resources, there is an insignificant relationship between being born to South Asian parents and cognitive test scores

at age 10 and a negative significant association between being born to Afro-Caribbean parents and test scores at age 10. Having re-assured ourselves that the composition of the restricted sample is not substantially different (see also table A2 in Appendix A), we now move on to focus on the *progression* of pupils between ages 5 and 10.

In column (2a/b), we estimate a model of age 10 cognitive achievement controlling for prior achievement at age 5 (i.e. including the standardized English Picture Vocabulary Test -EPVT- score at age 5). Children who obtain good scores in EPVT at age 5 obtain better scores in the Edinburg Reading Test (ERT) at age 10. Column 2a does not allow for differences across local authorities, whilst column 2b includes LEA fixed effects. In the model which does not include controls for local authority, the coefficient on South Asian is positive and significant and the coefficient on Afro-Caribbean is negative and significant. In the specification which controls for LEA however, as well as prior achievement at age 5, ethnic origin is significant and positive for pupils of South Asian background and negative but not significant for children with Afro Caribbean parents. This implies that children with South Asian parents “catch up” to between ages 5 and 10, whilst the gap between children with Afro-Caribbean parents and UK born parents remains unchanged during primary school though the negative sign hints at children of Afro-Caribbean extraction falling further behind. In other words, children with Afro-Caribbean parents do not catch up with children who have UK born parents, at least not during primary school. This result is very similar to that of Dustmann et al. (2010) using recent cohort of pupils (ie. over the period 1998-2007).

In column (3a/b) of table 6 we model the value added relationship in a more restricted model. In this specification, the dependent variable is the difference between the child’s score in the ERT at age 10 and their scores in the EPVT at age 5. This variable is constructed on the basis of differences in the quantiles achieved across the two tests. Due to the limited sample size, we use 50 quantiles. Note that in this specification not only do we have a difference variable as the dependent variable in the regression but we also control for age 5 test scores. This is because we are trying to determine how ethnic origin affects a move up or down the test score distribution between ages 5 and 10, controlling for where each child starts in the distribution at age 5 (EPVT score at 5). Clearly it is not possible to move down the distribution if you start at the first quantile and you are much more likely to move up the distribution. We control for this by including the age 5 quantile which is negative and significant as expected. This approach confirms the previous result, namely that South Asian origin children make more

progress from age 5 to age 10 than UK/European heritage children. Afro-Caribbean children do not catch up with UK/European origin children

Table 6. The impact of ethnic origin on progression in cognitive test scores between the ages of 5 and 10

	ERT (age 10)		ERT (age 10)		Quantile change between 5 and 10 (ERT-EPVT)	
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
UK/Europe	ref.	ref.	ref.	ref.	ref.	ref.
South Asia	0.004 (0.125)	0.067 (0.128)	0.279** (0.119)	0.3322*** (0.1213)	2.386 (1.723)	3.145* (1.757)
Afro Caribbean	-0.344*** (0.090)	-0.225** (0.094)	-0.201** (0.086)	-0.0970 (0.0889)	-2.742** (1.242)	-1.382 (1.289)
Other/Mixed	-0.003 (0.050)	0.011 (0.050)	0.027 (0.047)	0.0395 (0.0478)	0.320 (0.688)	0.490 (0.693)
Individual characteristics	✓	✓	✓	✓	✓	✓
Family background	✓	✓	✓	✓	✓	✓
LEAs fixed-effects		✓		✓		✓
EPVT score at 5			0.310*** (0.010)	0.3150*** (0.0100)		
Quantile EPVT score at 5					-0.691*** (0.010)	-0.687*** (0.010)
Constant	-2.866*** (0.443)	-2.824*** (0.517)	-2.871*** (0.420)	-2.861*** (0.489)	-24.581*** (6.079)	-24.648*** (7.098)
Obs.	8613	8613	8613	8613	8613	8613
Adjusted R ²	0.250	0.254	0.327	0.333	0.399	0.404

Data Sources: 1970 BCS Age 0 survey, 1975 BCS Age 5 survey, 1980 BCS Age 10 survey. Notes: dependant variables are standardised test scores (ERT) at age 10 for the six first columns and the difference between quantile at age 10 and quantile at age 5 in the last two columns. Standard errors are in parentheses. ***: significant at 1%, **: significant at 5%, *: significant at 10%.

The results differ somewhat when the analysis is repeated using the age 10 FMT tests (table 7). Although the coefficient on the South Asian variable is again positive across all specifications, suggesting some catch up with children of UK/European origin, it is not always significant. Though in our preferred specification, which controls flexibly for age 5 test scores and includes local authority fixed effects the coefficient is indeed significant (column 2b). Pupils with parents of Afro-Caribbean origin actually fall behind those of

UK/European born parents between ages 5 and 10 in these models of mathematics skill. It is worth noting that the models of the Edinburgh Reading Test also suggested a negative association between being of Afro-Caribbean heritage and test scores, though it was not significant.

Table 7. The impact of ethnic origin on progression in cognitive test scores between the ages of 5 and 10

	FMT (age 10)		FMT (age 10)		Quantile change between 5 and 10 (FMT-EPVT)	
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
UK/Europe	ref.	ref.	ref.	ref.	ref.	ref.
South Asia	-0.043 (0.127)	0.043 (0.129)	0.192 (0.123)	0.267** (0.124)	1.161 (1.797)	2.303 (1.824)
Afro Caribbean	-0.473*** (0.091)	-0.325*** (0.095)	-0.351*** (0.088)	-0.217** (0.091)	-5.474*** (1.295)	-3.441** (1.339)
Other/Mixed	0.032 (0.051)	0.052 (0.051)	0.057 (0.049)	0.076 (0.049)	0.970 (0.718)	1.267* (0.719)
Individual characteristics	✓	✓	✓	✓	✓	✓
Family background	✓	✓	✓	✓	✓	✓
LEAs fixed- effects		✓		✓		✓
EPVT score at 5			0.264*** (0.010)	0.266*** (0.010)		
Quantile EPVT score at 5					-0.750*** (0.010)	-0.748*** (0.010)
Constant	-3.654*** (0.449)	-3.576*** (0.521)	-3.659*** (0.432)	-3.607*** (0.501)	-35.893*** (6.357)	-35.613*** (7.368)
Obs	8613	8613	8613	8613	8613	8613
Adjusted R ²	0.226	0.238	0.282	0.294	0.404	0.414

Data Sources: 1970 BCS Age 0 survey, 1975 BCS Age 5 survey, 1980 BCS Age 10 survey. Notes: dependant variables are standardised test scores (FMT) at age 10 for the six first column and the difference between quantile at age 10 and quantile at age 5 in the last two columns. Standard errors are in parentheses. ***: significant at 1%, **: significant at 5%, *: significant at 10%.

6. Conclusions

In this paper we consider the relative academic achievement in primary school of second generation immigrant children in the UK. We use data for a cohort born in 1970 and find that children born to South Asian or Afro-Caribbean parents have significantly lower levels of cognitive achievement in both mathematics and language at the end of the primary school phase. However, as predicted by theory, much of this difference is attributable to other characteristics of these second generation immigrant children, such as their socio-economic background, parental education and resource inputs available to the child. Once we account for these other differences, the negative effect of being from a South Asian ethnic origin on test scores at age 10 becomes insignificant. This implies that it is other features of South Asian children's family background that explain why they have lower test scores at age 10, including family resources and parental inputs. However, children of Afro-Caribbean ethnic origin continue to have significantly lower levels of cognitive skill at age 10, even allowing for differences in family background. These are differences in cognitive achievement that we cannot explain even by allowing for a rich set of family background measures, including family income and parental education.

We then investigated the progression of ethnic minority children in primary school i.e. between the ages of 5 and 10. This analysis indicates that the negative impact from being born to South Asian parents actually decreases during primary school, at least for language skills (as measured by the Edinburgh Reading Test) and hence these children are catching up relative to their UK/European heritage peers. Note that these models control separately for both the language spoken in the home and test scores on entry into primary school and hence this effect is not purely because South Asian children enter school with relatively poor *English* language skills and improve them over time. We also found that in terms of their cognitive skills in language, Afro-Caribbean origin children do not catch up with their UK/European origin peers and in fact in mathematics they fall further behind.

Hence we observe two key phenomena, firstly we observe the lower achievement of ethnic minority children in primary school, which remains the case today (Wilson et al. 2009), and secondly we observe that only South Asian children appear to catch up in primary school. Our analysis uses very rich data, far richer than is available in current administrative data and hence we are more confident that these trends we observe are not attributable to the socio-economic circumstances of ethnic minority families, nor the aspirations of parents in this

community, nor indeed to the language spoken in the home. What might explain this result? To the extent that we control for the child's individual characteristics and the family resources available to the child, there are a number of potential explanations for our result. Firstly, it may be attributable to differences in school quality experienced by ethnic minority children and that we are unable to control for in our model (though we do control for differences across local authorities). Secondly, it may be attributable to "discrimination" or differences in the way that teachers interact with ethnic minority children, though recent evidence suggests that teachers do not under estimate the abilities of particular ethnic minority groups of students. Of course we also cannot discount that our result may be attributable to other unobservable characteristics of ethnic minority families that we do not control for in our data despite the richness of our set of controls.

Our results, though they date from the 1970s, are an additional piece in the puzzle about the relative academic achievement of ethnic minority children in the UK. Evidence from the current education system (Wilson et al. 2009) suggests that although children from most ethnic minority groups have relatively low achievement on exit from primary school (as we find for the 1970s period), they also experience considerable catch up and indeed overtake their White counterparts during secondary school. Our evidence shows that even as long ago as the late 1970s, some groups of ethnic minority pupils, namely those from South Asia, were showing signs of 'catch up' in primary school. This implies that the "catch up" phenomenon is part of a longer term trend rather than necessarily attributable to the policies introduced to improve the educational performance of ethnic minority students in the intervening period. The reasons for both the persistent lower achievement of ethnic minority students in primary school over a forty year period and the fact that some ethnic groups (but not others) appear to "catch up" require further research, particularly into the home learning environment that determines the cognitive skills that pupils start school with and the quality of primary school attended by different ethnic minority groups.

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Notes

1. First-generation immigrants (e.g. children who have immigrated after 1970) are small in number and unfortunately have not been tested at age 10.
2. "Indian subcontinent" and "West Indies" are the original labels used in BCS 1970 to define people born in those regions. In this paper we will use "Caribbean" instead of "West Indians" and "South Asia" rather than "Indian subcontinent".
3. We also introduced age at testing in months in our regressions as the length of the fieldwork (up to 14 months at age 5) implied some pupils were tested younger than others. And we know that those differences matters at such young age (see Crawford et al., 2007).